If we look just now in the Botanic Garden at any of the old summer beds of half-hardy plants, we shall see them shrouded in a maze and network of white fleecy mould. That mould is a fungus finishing the work of extermination which the frost has begun, and then burning the bodies. In all the odd corners there are heaps of rotting vegetation. These stems and leaves are not rotting of themselves; heat them to 212° F., so as to kill the seeds of the fungi, and seal them up in closed cases, and although they will slowly decompose, they will never rot. They are being burned by the process of respiration of fungi just as effectually as they would be if they were collected into a heap, dried, and set fire to. Most of these fungi are very minute, but each of them, when it is found in anything like a well-developed condition, is thoroughly characteristic. Still they are so small and so simple that it is difficult to distinguish parts of those organs whose form is not strongly marked.

I will give a brief sketch of the life-histories of one or two of these fungi, and the first I will choose is a well-known mildew, *Mucor stolonifer*. This species is often found on juicy fruits, covering them with white woolly patches scattered over with small black heads, and producing a very rapid putrefaction beneath the surface of the fruit. A number of delicate branching filaments form a rich network in the substance of the fruit, filaments which are easily distinguished from those of some nearly-allied forms by their long simple tubes without partitions. These delicate filamentous tubes, which are the parts first to appear, and form the basis, as it were, of the fungus, are called the *mycelium*, and are found in almost all fungi. From the mycelium, at certain points, long rather wide tubes start from the surface on which the fungus is growing obliquely into the air, and, after running along for a time, again dip down and give origin to other tufts of mycelium tube-roots. At the point where these roots come off, as at the bud of a strawberry-runner, a little tuft of tubular stems rises up vertically, and ends in round vesicles which at first are entirely filled with transparent protoplasm. These are cut off from the stem by a partition which is at first flat, but afterwards assumes an arched form, giving the space between it and the outer wall the shape of a very deep meniscus. The protoplasm in the space ultimately breaks up into a mass of black polygonal spores, which escape by the giving way of the outer wall of the sporangium. These spores are thus produced by no process of true reproduction, but are simply separated particles of the protoplasm of the parent plant. In hot summer weather, chiefly on the surface of sour fruit, *Mucor stolonifer* forms thick patches, with broad stolons, and from these, twigs spread over the surface of the fruit. When two of these twigs meet one another they form large vesicular expansions, and then apply themselves to one another. A diaphragm is formed across each of the vesicles, thus cutting off the distal end of the vesicle, which is filled with protoplasm. The double wall between the two cells gives way, and the protoplasm in the two unites, as in the union of the cell-contents in the conjugation of *Zygnema*. These "coupling cells" have thus become fused into a single cell called a *zygospore*, which goes on enlarging, and is covered with a thick skin.

The simple spores, when scattered on moist ground, send out filamentous shoots of mycelium, which in their turn originate stolons as before; but the zygospores do not produce mycelial filaments when they germinate, but form one or two sporangium-bearers directly at the expense of the substance of the zygospore, and the ordinary course of growth is resumed from their spores. There are thus two modes of multiplication in *Mucor*—one by sporangia and spores, non-sexual, a simple method of propagation by buds—the other a true reproductive process, by the conjugation of male and female elements. It seems to be only occasionally and under specially favourable circumstances that the latter process occurs, and this mildew often goes on reproducing itself by spores alone for many generations.

The life history of *Mucor mucedo*, one of the commonest of the mildews, is not yet thoroughly known. Here the cells are again simple and undivided, but each sporangium-bearer usually ends in several large sporangia. Under certain circumstances this sporangium-bearer sends out tufts of finely dividing twigs, each of which ends in a small sporangium, which, to distinguish it from the larger form, has been called a sporangiolum. At other times processes are produced from the main cells which rise into delicate tubular branches, and give off globular cells which are called *conidia*—simple external spores, differing entirely in their character from the spores produced in sporangia; and if this mould be grown in a solution in which it is fairly nourished without a full supply of oxygen gas, long fibres are produced which break up into a multitude of separate bead-like cells filled with protoplasm, and capable of reproducing the organism. WYVILLE THOMSON

(*To be continued.*)

EXPLORATION OF THE SOUTH POLAR REGIONS

II.

WHILE Balleny was making the discoveries to which we alluded at the close of the previous article, two other expeditions were actively pursuing their researches and extending our knowledge of the Antarctic regions,—a French expedition under Dumont d'Urville and an American under Lieutenant Wilkes. Neither expedition was originally intended for South Polar exploration, and to this among other reasons is it to be ascribed that the results, with respect to the exploration of the South Polar regions, are of but little value compared with those obtained by the almost contemporaneous English expedition.

From the South Shetlands D'Urville directed his course to the south, and discovered on February 27, 1838, in 63° 10′ S. lat. and 57° 5′ W. long., a coast which bears the name of Louis Philippe Land, and rises to a height of between 2,000 and 3,000 feet above the sea. The general outlines of this coast were already indicated on Weddell's chart.

Two years later we find the same explorer again active, and with a better result. In January 1840 he left Tasmania for the south, steering for the region between 120° and 160° E. long. On January 19, in 66° S. lat., he found land from 2,000 to 3,000 ft. high, entirely covered with snow and ice. On the 21st some of the sailors landed on a little island consisting of gneiss, which D'Urville named Adelie Land. On the 30th and 31st D'Urville sailed round a promontory in 64° 40′ S. lat. and 132° 20′ W. long., naming this part of the coast Clairie Land. Shortly after this the expedition turned northwards, a number of the men having been lost through illness. Dr. Neumayer seems to think that the French constitution is not at all well adapted for expeditions of this kind.

On February 25, 1839, four ships, under the command of Lieutenant Wilkes, set out from Orange Harbour in Terra del Fuego, for the purpose of exploring these southern seas. The season was, however, too far advanced to admit of much being accomplished, though one of the ships, the *Flying Fish*, under Lieutenant Walker, penetrated as far south as the 70th degree of latitude in 100° 16′ W. long., and that at the end of March. This in itself is a fact of some interest and value, that so late in the season a point was reached as far south as Cook and Bellinghausen attained to, two months earlier.

On December 27 of the same year the squadron left Sydney, again for the south. Two of the ships, the *Flying Fish* and the *Peacock*, were soon compelled to return on account of injuries, so that there were only the two vessels, the *Vincennes* and the *Porpoise*, left to pursue their discoveries. On January 30, 1840, in 140° 2′ 30″ E. long., and 66° 45′ S. lat., Wilkes saw for the first time clearly and distinctly the land standing out of the mist; to this he gave the name of "Antarctic Continent." Five days previously the *Vincennes* reached its farthest south point, 67° in 147° 30′ E. long., where it was hard bestead by the ice. Indeed both vessels during their course along the coast had constantly to fight with the ice, and were frequently in the greatest danger of being crushed. Wilkes found the coast girt by a wall of ice, 150 to 200 ft. high, behind which rose the mountains to a height of 3,000 ft. He advanced thus to 98° E. long., and hoped on February 17 to be in a position to reach the point in this quarter to which Cook had come in 1773; but the ice-wall compelled him to turn to the northeast, quite away from the desired point. After he had followed the wall of ice to 62° S. lat. and 100° E. long., he had to give up all hope of being able to penetrate farther west, and returned to Sydney.

The expedition under Wilkes had travelled over a stretch of 1,500 miles along the margin of the ice, and frequently in sight of land. Even if through their labours the continuity of the land through its whole extent was by no means proved, yet the extension of Balleny's discovery in connection with that of D'Urville's considerably increased the probability of the existence of a great mass of land in these regions. Moreover, the observations made by Wilkes and his officers are of the highest value to science. It has been latterly disputed to whom belongs the merit of having first discovered the Antarctic Continent, both French and Americans claiming it each for themselves. But in the present state of our knowledge we must characterise such a dispute as perfectly objectless, for Balleny two years earlier had discovered his Sabrina Land, and had seen the coast at other points; therefore to him, if, indeed, an Antarctic Continent of the extent indicated by Wilkes exists, the honour of discovering it must be ascribed.

The researches initiated by Gauss and the Göttingen Society into the nature of the magnetism of the earth had given rise to a number of undertakings which had for their object to assist inquiry in this direction. From the southern hemisphere trustworthy data were altogether wanting, and on this account the British Government resolved to send an expedition to the magnetic South Pole, and that moreover, under the leadership of Captain James Ross, who had spent the greatest part of his earlier youth in the North Polar regions, and already in the year 1831 had discovered the magnetic North Pole. The results of his expedition, therefore, are incomparably rich and valuable.

After some preparatory cruising, the two ships, the well-known *Erebus* and *Terror*, well appointed for their work, set out from Hobarton on November 12, 1840, directing their course southwards, after a brief visit to Campbell Island. On December 27 the first ice was seen in 63° 20′ S. lat., and 176° 30′ E. long., and on January 1, 1841, the Polar circle was passed in 170° E. long., where the ships first encountered the pack-ice. Sir James, after careful consideration, determined to endeavour to penetrate the inner masses of pack-ice which, by the two previous voyagers, had only been skirted, and on the 9th, in 69° 15′ S. lat., and 176° 15′ E. long., came out into open sea. On the 11th land was discovered in 71° 15′ S. lat., the mountains of which, covered with perpetual snow and ice, reared themselves high into the air. The highest of these was named after Sir Edward Sabine, who for more than half a century, says Dr. Neumayer, has devoted his energies to researches in physical geography in all regions and in all parts of the earth, and who has largely added to our knowledge, especially of terrestrial magnetism.

The whole land, which Ross followed to nearly 79° S. lat., he named South Victoria Land, and an active volcano, 12,400 feet high, which he discovered on January 28, he named Mount Erebus. The name of the *Terror* was given to an extinct volcano, somewhat higher than the other, lying farther to the east. On the same day it was found that farther advance was impracticable, as the explorers found themselves suddenly face to face with an immense wall of ice, from 150 to 200 feet high, exactly similar to that which had been seen by D'Urville, Wilkes, and others. In the far distance over this wall they descried mountain peaks of great height and covered with ice: Ross named them after Parry.

In the vain attempt to reach the end of the ice-wall or find an opening in which the ship could pass the winter, they gained, on February 2, in 173° E. long., their greatest south latitude of 78° 4′. The rest of the month Ross spent in the further exploration partly of the southern sea and partly of the coast of the newly discovered Victoria Land from Franklin Island to the North Cape, when he turned his course to the west in 70° 40′ S. lat. In 68° S. lat. and 165° E. long. was seen a series of what seemed either islands or mountain peaks belonging to the continent, and farther on were seen the islands discovered by Balleny. Ross found that the land placed by Wilkes on his chart under 65° 40′ S. lat. and 165° E. long., in reality did not exist. As about the beginning of March the young ice began rapidly to form, Captain Ross determined to return northwards. On the return voyage, magnetic researches of the highest value were made. More especially was determined the position of the line of non-deflection of the compass.

On November 25, 1841, the expedition again shaped its course southwards. On December 16, in 57° S. lat., Ross reached the first ice, and on January 1, 1842, crossed the Polar Circle in 156° 28′ W. long., surrounded at times by pack-ice. On February 2, 1842, in 68° 23′ S. lat. and 159° 52′ W. long., the vessels reached open water, and on the 23rd of the same month, they approached, in 77° 49′ S. lat. and 162° 36′ W. long., a perpendicular wall of ice, only half the height of that in the neighbourhood of Mount Terror. On this day also they reached in 161° 27′ W. long. their highest latitude, 78° 9′ 30″ S., where they observed unmistakeable signs of neighbouring land. On the following day was commenced the return journey, and on April 6 the ships anchored at Port Louis, in the Falkland Islands.

On December 17, 1842, Ross set out a third time for the far south, this time to explore D'Urville's Louis Philippe Land, and to penetrate to the region which Weddell had reached in 74° 15′. There is little to record for our present purpose concerning this journey, but that, amid the greatest difficulties and dangers from the ice, the two plucky ships penetrated as far south as 71° 30′ in 14° 51′ W. long., on March 5, 1843. On September 2, the two ships *Erebus* and *Terror* reached England, and fifteen months later, under the guidance of Sir John Franklin, they set out again towards the north, from which they never returned.

Such is a brief review of the progress of geographical knowledge in reference to the South Polar regions. In what follows it is not intended to give a comprehensive analysis of the valuable material contained in the journals of the various voyages concerning the nature and physical conditions of these regions, but only to bring into prominence what is of greatest importance, and, in connection therewith, what is of importance to any expedition that may yet be organised, to draw some general conclusions as to the form of the South Polar regions. By this means a rational plan may be suggested for the further investigation of these regions.

In these observations the conditions as to ice claim our attention in the first place, as they enable us to draw important conclusions with respect to the extent of the land and the currents inside the Polar Circle. With reference to the latter, the drift-ice is of special value, as it enables us to recognise them in spite of the surface-currents caused by the winds and obliterating the main phenomena. In the southern hemisphere drift icebergs of 200, 300, and even more feet in height above the water are common; and if we take into consideration that their depth under the water must be six or seven times greater, we shall be able to understand that the movement of these ice-masses, which, moreover, are of colossal extent horizontally, must be the result of various forces working upon them. Under-currents, surface-currents, and prevailing winds, have to be considered in interpreting this phenomenon, according to the size and proportion of the mass presented; though the comparatively feeble surface-currents are of subordinate importance.

It would lead us too far here were we to attempt a thorough discussion of all the modifying causes and phenomena; it need only be mentioned that the water-masses of the Polar zone move, so to speak, to lower latitudes, as is sufficiently expressed in the so-called "Antarctic Drift." And by the south-east winds, which prevail in the southern summer, colossal masses of ice during that season push their way northwards, where they partly break up, but partly also are driven back by the north-west winds of autumn to the south. Although nothing certain can be said concerning their course towards the Pole, and only in particular circumstances is a south-easterly return movement established, yet it may in general be stated with regard to the masses which outlast the summer, that their northward and southward course may be explained by a periodical prevalence of the impulse from the surface or under-current. In winter, when the Antarctic drift-current, on account of the smaller differences of temperature and evaporation in lower latitudes, is less powerful, will the impulse, strengthened by the north-west winds, be directed towards the south-east or the south? Also, the movements of the ice during the other seasons can only be explained in this way; and on this account is the study of the various ice-charts of considerable advantage, especially the chart of the British Admiralty, on which are registered the results obtained from the commerce of the world.

The glacier ice-walls, of which we have accounts in several narratives of voyages, are, through the almost unbroken, and in winter specially rapid formation of ice, pushed continually farther and farther on into the sea, until at last, being insufficiently supported at the bottom, and subject to the buffetings of the waves, they break into pieces. Towards the end of the cold season this disintegration is still further assisted by the great differences of temperature betwixt air and water in high south latitudes, and with the setting in of September commences the journey of the masses of drift-ice from the south. It is in consequence of this that during the southern winter, scarcely any drift-ice is found on the great highways of the world's commerce. The result of a strict comparison is that the frequency of the occurrence of ice in June and December is in the proportion of 1 to 13. Further, that the prevalence of the drift-ice is greater in March and April than in September and October, is only a further proof of what has been stated, seeing that in the last-mentioned months the ice is still in the neighbourhood of the spot where it was formed, while in the former months it has either not yet been broken up, or has not got beyond the bounds of traffic on its return journey.

The masses of drift-ice do not everywhere move equally far to the north: in some places they are met with much nearer the equator than in others, as will be seen if we examine the region around the poles on the charts on which the position of the ice in the various months is laid down. The causes of this inequality are to be seen partly in the conditions of the current, but also in the difference of the distances from the pole of the places of formation of the various masses of ice: indeed, the greater this distance is, so much farther to the north, *cæteris paribus*, will the ice be driven. We might now attempt to construct an average boundary line for the equatorial drift-ice, but from the variety of the boundaries and the lack of material for this purpose, its course would be very indefinite. We shall best arrive at useful results if we draw these boundaries in accordance with trustworthy notes, leaving meanwhile peculiar, and evidently altogether abnormal circumstances out of account. The ice is found in some pathways of commerce in much greater force than in others. According to the excellent map appended to Dr. Neumayer's pamphlet, the drift-ice extends farthest into the South Atlantic Ocean, where it makes its way to the 40th parallel of latitude, while in the Pacific Ocean its boundary coincides nearly with the 52nd parallel; in the Indian Ocean the limit lies between the 40th and 50th degree of latitude. Clearly the cause of the ice pushing its way so far into the Atlantic Ocean is to be found in the fact that most of the icebergs there met with have their origin about Graham's Land and the South Shetlands lying far to the north, and, according to Towson's observations, they sail northward at a daily rate of ten miles in an easterly direction, when once they are exposed to the combined influence of the current and the westerly winds

It is easy to see that these attempts to fix an average boundary are fraught with difficulty, and therefore, also, with uncertainty, especially when it is taken into consideration that all parts of the ocean have not been equally explored—many, indeed, not at all, or only by single vessels. By an uncritical examination of all the collected facts relating to the subject, one might be led to very false conclusions. Therefore we ought to examine most narrowly any conclusions which may be drawn at first from the frequency of observation; but for so complicated an inquiry, the material within reach is by no means sufficient, and therefore we must seek for help from some other quarter. Those parts of the ocean are best compared which have been explored by a nearly equal number of ships. But this at present is the case only along the regular routes in the South Atlantic, the Indian, and the South Pacific Oceans, and therefore in these cases an immediate comparison is admissible. By such a comparison it is immediately perceived that in each of the oceans places are found which are almost free from drift-ice, and that throughout the whole year. A specially valuable means of determining such places as are free from ice, is the fact that, towards the equator, a gap in the ice-boundary is shown, through which a ship coming from lower latitudes may sail to the 60th degree south without having to pass through ice. These ice-free areas may be set down as follow :—

1. To the south-west of Cape Horn the boundary of the drift-ice reaches down to about 57° S. lat.
2. Between the 60th and 80th degree of E. long. the boundary is found in 61° S. lat.
3. Between 160° E. and 175° W. long. it has the same limit as in No. 2.

Of course, icebergs, which are influenced more by surface currents and the prevailing winds than by under-currents, are occasionally found in these clear areas; especially is this the case in years which are exceptionally abundant in ice, as was the case in 1854-5.

Let us inquire, now, what kind of explanation can be given of these phenomena. These will naturally result, in some measure, from the considerations previously advanced: either the place of their origin must be placed far to the south of the places indicated, so that the icebergs have a long journey to make before reaching the highways of commerce; or the conditions of temperature within the region indicated are favourable to the melting and disintegration of the ice; or finally the direction of the current is such that the icebergs cannot reach the north. The winds, so far as the present question is concerned, can exercise no influence, for all round the Pole they are nearly the same for the same parallels. With regard to the currents which are open to direct observation, it is difficult to come to any fixed conclusions, for these observations refer only to the surface-currents, which are almost universally caused by the prevailing winds. Besides, the observations as to currents of the usual kind, for special purposes, are not to be relied on. That an interchange of water takes place, besides that in the way of the general drift, through powerful currents, we know through many instances which need scarcely be mentioned. The question is concerning the position of these currents, their exact course in the various oceans. But for this purpose the drift-ice offers a capital means of solution, while the warm currents born of the water from the equator, in virtue of their southerly direction against the advance of the ice, and in virtue of their temperature, must be highly unfavourable to the continuance of this. Further, it is evident that the interchange of water occurs along such routes as are determined by the rotation of the earth and the configuration of the lands and the bottom of the seas. These routes will lead to places lying as far as possible from the Pole. All three would agree in furnishing strong proofs that the area is free from ice, if only we assume that the warm waters of the equator proceed southwards towards the places referred to.

In reference to that principal current of the ocean which is always referred to in a theoretical view, it may be said that the fact has been established that the equatorial waters, in their powerful currents from east to west, are made to diverge by the east coast of the Continent, and turned towards the Poles in both hemispheres. We find the direction taken by the south in a current along the east coast of America, of Africa, and Australia, from which it then makes its way towards the south-east, and when not to be recognised as a surface-current, it will be found to have assumed the form of an under-current of much greater force. The warm South American current will probably split on the point of Graham Land; one part makes for Alexander Land, the other towards that part where Weddel, after he penetrated the pack-ice, reached water free of ice. The Australian branch tends towards Victoria in the south of New Zealand, and made it possible for Sir James Ross to reach the 78th degree of S. latitude, while the Mozambique or African current flows towards the Pole, beyond Kerguelen Land, between Termination and Kemp Lands. In the first two cases we have positive proof; while with respect to the last, the evidence for a correct judgment can only be obtained by researches in the high south. The direction of the axis of the ice-free area is, in agreement with the general direction of the current, according to the present condition of our knowledge, from north-west to south-east; at least this is true for the Indian and Pacific Oceans, while the wedge-shaped form of South America must tend to modify the general rule.

We know from several voyagers that a girdle of pack-ice lies around the Poles, whose position and strength are liable to change, though in a less degree than is the case with the drift-ice. Naturally in this case, the evidence necessary to a determination of the mean position is still more scarce, and still more data must be obtained to form a mean value, although the pack-ice girdle thus obtained can only have an ideal importance. If we follow the boundaries of this pack-ice girdle, we notice to the south of New Zealand a bend towards the south analogous to that of the drift-ice, only shifted in accordance with the general direction of the current; also on the west side of Graham Land this tendency of the ice to bend towards the south is noticed, for it is always influenced by the direction of the land. To the south of Kerguelen Land the pack will only be to the west of Termination Land, and, indeed, stretching in a direction which makes us suspect another bend towards the south.

We must yet mention a sort of product of the drift, of considerable importance in ascertaining the condition of the drift and the ocean-currents, viz., the seaweed. This is loosened from its position especially by drifting icebergs, and turned adrift to the play of the waves. This conglomeration of plants, which reaches a little above the surface, though the long fibres stretch deep down into the water, shows the currents very correctly, for it is as little influenced by the winds as a drifting bottle. The curve that limits the place of growth is confined, in the Atlantic and Indian Oceans, to about the 60th meridian of E. long., near to that of the drift-ice. In some places this also holds good for regions to the south of Australia and the south-east of New Zealand. At all events, it can thus be understood how those places which are free from drift-ice are also free from drift-weed, a point of some importance when we consider the fact that drift-weed is the attendant of icebergs. According to the Dutch voyagers, on the west of the meridian of Paul and Amsterdam are found weeds different from those on the east thereof, which points to a different current.

(*To be continued.*)

TYNDALL'S RESEARCHES ON RADIANT HEAT

Contributions to Molecular Physics in the Domain of Radiant Heat. By John Tyndall, LL.D., F.R.S. (Longmans, 1872.)

FORTY years ago our knowledge concerning the radiation and absorption of heat was very meagre. We believe that the earliest experiment in this direction is to be found in that wonderful book containing the "Essayes" of the Florentine Academicians. There we meet with the fact that the heat of the sun, converged by a mirror, can ignite a pastile placed within a Torricellian vacuum. A little later, in 1682, Mariotte communicated to the Paris Academy of Sciences that the heat of a common fire, made very sensible in the focus of a burning mirror, was entirely cut off by the interposition of a sheet of glass. The mirror in this case must have been of polished metal. These experiments were subsequently repeated and extended by Lambert, who, assigning the true cause, pointed out the necessity of employing metal, and not glass mirrors, in the reflection of heat from terrestrial sources. Lambert further showed that if the radiation from a clear fire were converged by a large glass lens, no heat was felt where the brilliant focus was seen, whilst Hoffmann first collected the obscure heat of a stove to a focus by a metal mirror.

About a century ago Franklin made his experiments with bits of coloured cloth on snow, and found that, whereas colour strongly influenced the amount of solar heat absorbed, it made little or no difference on the emission from a lamp or candle. Beyond the foregoing information, we believe little more was known in this subject till, in 1777, Scheele published his famous treatise on "Air and Fire." But a great deal of ignorant talk, clothing itself beneath a barbarous jargon, was prevalent at that time. Putting much of this aside, Scheele asks himself the question, which he was unaware Lambert had already answered, whether it was really the heat, or only the light of a fire, that was reflected from a metal mirror; but first he seeks to know whether there are different kinds of heat. "There will be many," he remarks, "who will not hesitate to give an answer to my queries; for I am well acquainted with the vague phrases according to which everything is called Fire that hath a distant similarity to it. But I am of opinion," he naively adds, "it is best not to begin to read before one knows the elements of the alphabet, and to withhold an answer till one has reflected on the following experiments." Then comes a series of admirably simple experiments, pregnant with important results. As they deserve to be more widely known than they seem to be, the reader will pardon our quoting Scheele's own words at length. They are to be found in section 57 of his work already alluded to:—"From these experiments"—made in winter, before an open stove, and with only a candle, a concave mirror, and sheet of glass and metal, for apparatus—"it appears," says Scheele, "that the heat, mounting with the air in the stove, and passing through the chimney, is materially different from the heat passing through the door of the stove into the room. That the latter heat departs from the centre, where it is generated in straight lines, and is reflected from polished metals under an angle which is equal to that of incidence. That it unites not with air, nor can be diverted by a current of air, into a direction different from that which it originally had received. For that very reason, the vapours of the breath are visible in this great heat; for since air and heat are really united during summer, and warm air can dissolve more water than cold air, it likewise hence appears that this kind of heat is not united with air, nor has this kind of heat probably rarefied the air; and of consequence it becomes evident why it causes no tremulous motion in sunshine. You may, by means of a glass mirror, separate the light from this heat, when the heat remains in the glass, and the radiant light yields no heat. Hence it follows that the heat, passing through the door of the stove, coincides, in some points, with the light, but is not yet quite become light, since it is not reflected in the same manner from a glass surface as from a metallic one—a remarkable circumstance. This heat is soon changed into the usual heat, whenever it unites with a body, which may be observed in the glass, and in the metallic concave mirror blackened by soot, and in more instances. Represent to yourself," he concludes, "a little hillock of burning coals; in this case the heat darting from this hillock all around is that which may be reflected by a metallic polished plate; that,